PROCEEDINGS

of the

American Society

of

Civil Engineers

OCTOBER, 1925

CONTENTS

THE ORADELL DAM OF THE HACKENSACK, NEW JERSEY, WATER COMPANY.
NICHOLAS S. HILL, JR., M. AM. SOC. C. E.

MOMENTS IN RESTRAINED AND CONTINUOUS BEAMS BY THE METHOD OF CONJUGATE POINTS.
L. H. NISHKIAN AND D. B. STEINMAN, MEMBERS, AM. SOC. C. E.

RELATION OF THE OHIO RIVER AND ITS TRIBUTARIES TO TRANSPORTATION IN THE UNITED STATES: A SYMPOSIUM.

FALL MEETING, MONTREAL, QUE., CANADA
OCTOBER 14-16, 1925

CURRENT PAPERS AND DISCUSSIONS

		Discussion closes
Standard Specifications for Concrete and Reinforced Concrete: Report of Joint Committee on Standard Specifications for Concrete and Reinforced Concrete	Oct., 1924, Jan., 1925	
Discussion	Sept., "	Uncertain
"Flood Flow Characteristics." C. S. JARVIS	Dec., 1924	
Discussion	Mar., Apr., May, Aug., Sept., 1925	Uncertain
Final Report of Special Committee on Stresses in Structural Steel	Mar., "	
Discussion	Apr., May, Aug., "	Uncertain
"Fire-Banks for Oil Storage." H. H. HALL	May, "	
Discussion	Sept., "	Oct., 1925
Papers Presented Before the Highway Division, January 22, 1925	May, "	
Discussion	Aug., "	Uncertain
Papers Presented Before the Sanitary Engineering Division, January 20 and 22, 1925	May, "	
Discussion	Aug., "	Uncertain
Progress Report of Special Committee to Codify Present Practice on the Bearing Value of Soils for Foundations, etc	May, "	
Discussion	Aug., "	Uncertain
"Municipal Water Supply Problems of Atlanta, Georgia." PAUL H. NORCROSS	Aug., "	Nov., 1925
High Specific Speed Hydraulic Turbines: A Symposium	Aug., "	
Discussion	Oct., "	Uncertain
"The Engineer as a Railroad Executive." JULIUS KRUTTSCHNITT	Aug., "	Nov., 1925
"The Reinforced Concrete Arch in Sewer Construction". CHARLES E. SHARP, JR.	Aug., "	Jan., 1926
"The St. Lawrence Waterway to the Sea". FRANCIS C. SHENEHON	Sept., "	
Discussion	Oct., "	Dec., 1925
"Multiple-Arch Dam at Gem Lake on Rush Creek in California". FRED O. DOLSON AND WALTER L. HUBER. (To be Presented Oct. 7, 1925)	Sept., "	
Discussion	Sept., "	Jan., 1926
"Power Development in the Middle West". W. L. ABBOTT	Sept., "	Dec., 1925
"The Improved Venturi Flume". RALPH L. PARSHALL	Sept., "	Dec., 1925
"Side Channel Spillways". JULIAN HINDS	Sept., "	Dec., 1925
Permissible Canal Velocities. SAMUEL FORTIER AND FRED C. SCOBEY	Sept., "	Dec., 1925
Excess Condemnation in City Planning: A Symposium	Sept., "	Uncertain

PROCEEDINGS

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American Society

of

Civil Engineers

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VOL LI OCTOBER, 1925 No. 8

CONTENTS

Society Affairs..... Page 333

Applications for Admission and Transfer..... Page 265

Reports, Papers, Discussions and Memoirs..... Page 1567

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SOCIETY AFFAIRS

CONTENTS

Items of Interest: PAGE

Montreal Meeting 333
September Society Meeting 333
Detroit Members Active in Local Engineering Circles 334
List of Official Nominees for Officers of the Society 334
Biographical Sketches of Official Nominees for Officers of the Society 335
Committee Appointments 340
Arch Dam Investigation—Proposed Details 340
Colorado Engineering Council Active in Public Affairs 346
Associated General Contractors Issue Manual 346
Georgia Section Drafted for Public Service 347
Employment Service Expands to Chicago 347
Brashear, the Star Gazer 348

Local Sections:

Colorado 350
Portland 350
Sacramento 350
San Francisco 351
Western Washington 351

Engineering Societies Library 353

Current Engineering Literature 354

Employment Service 362

Membership 363

AMERICAN SOCIETY OF CIVIL ENGINEERS

PROCEEDINGS

VOL. LI OCTOBER, 1925 NO. 8

SOCIETY AFFAIRS

Montreal Meeting

No one who has examined the final program for the Fall Meeting in Montreal, October 14-16, 1925, sent to the membership a fortnight ago, can fail to experience the lure of the old Canadian city and its modern attractions to the engineer. It is too early to forecast accurately the attendance; all signs, however, point to a profitable and at the same time enjoyable gathering. The sessions will take on something of an international flavor as American engineers enjoy the hospitality of their Canadian brethren. Now is the best time to "obey that impulse" and send in the acceptances for the Montreal Meeting.

September Society Meeting

The first regular business meeting of the Fall was held at Society Headquarters on September 2, 1925. President Ridgway called the meeting to order at 8:05 P. M. After announcements of future meetings by the Secretary, the meeting proceeded to consider the paper of the evening entitled "The Reinforced Concrete Arch in Sewer Construction", by Charles E. Sharp, Jr., Esq. In the absence of the author, N. T. Veatch, Jr., M. Am. Soc. C. E., of Kansas City, Mo., presented the subject, briefly outlining the origin of Mr. Sharp's studies, their scope, and the results obtained in connection with the immense River Des Peres Sewer in St. Louis, Mo. In opening the discussion, Charles Terzaghi, Assoc. M. Am. Soc. C. E., stressed the fact that when the loads on the sewer arch are known, the structural design is comparatively simple, but that the impossibility of accurately determining the earth pressure brings the whole analysis into serious uncertainty. The discussion was continued by George Paaswell, E. G. Haines, Kenneth Allen, and A. W. Buel, Members, Am. Soc. C. E., with a closing discussion by Mr. Veatch. In view of the summer season, the attendance of approximately 45 was creditable. The meeting adjourned at about 9:05 P. M.

PAGE
... 333
... 333
... 334
... 334
... 335
... 340
... 340
... 346
... 346
... 347
... 347
... 348
... 350
... 350
... 350
... 351
... 351
... 353
... 354
... 362
... 363

Detroit Members Active in Local Engineering Circles

It is gratifying to observe from the alert July *Bulletin* of the Associated Technical Societies of Detroit that members of the Society are taking a large and important part in public activities around Detroit. First, it is to be noted that the current President of the Detroit Engineering Society is George H. Fenkell, Director of the Society from District No. 7. A second item announces as among the sixteen local representatives of Engineering Foundation, five belong to the Society, including Messrs. P. A. Fellows, C. W. Hubbell, D. A. Molitor, A. H. Place, and J. H. Wasson. A third item states that on July 1, Alex Dow, M. Am. Soc. C. E., was appointed to a vacancy on the Detroit Board of Water Commissioners. Of course the Local Section of the Society is a prominent factor in the work of the Association. If these activities are representative of the share Civil Engineers always assume in Detroit engineering circles, it is clear they are bearing their full portion of the load.

How Can the Society Better Serve its Members and the Profession at Large

The new Committee on "Aims and Activities" appointed by the Board of Direction at the Salt Lake City meeting (see September, 1925, *Proceedings*, page 306), is actively studying its problems.

A meeting of the Committee was held in Chicago, Ill., August 27 and 28. On the evening of the 27th, the Illinois Section met with the Committee for an open discussion of various matters of interest. A second meeting was called at Buffalo, N. Y., on September 25, and still another will be held about October 11. The Committee is open for suggestions from any members as to how the aims of the Society can best be accomplished, and as to what activities may be undertaken to lead to better service.

The Committee is composed of: H. D. Dewell, of San Francisco, Calif., T. L. Condron, of Chicago, Ill., C. M. Spofford, of Boston, Mass., Willard T. Chevalier, of New York, N. Y., *Secretary*, and Charles H. Paul, of Dayton, Ohio, *Chairman*.

Suggestions forwarded to either the Secretary or the Chairman will be welcome, and will greatly assist the Committee in realizing its forward looking ideals.

List of Official Nominees for the Offices to be Filled at the Annual Election, January 20, 1926

For President to serve One Year:

GEORGE S. DAVISON, Pittsburgh, Pa.

For Vice-Presidents, to serve Two Years:

Allen Hazen, New York, N. Y. ..... To Represent Zone I
Walter L. Huber, San Francisco, Calif. ..... " " " IV

For Directors, to serve Three Years:

Frank M. Williams, Albany, N. Y.	To Represent	District	No.	3
D. H. Sawyer, Washington, D. C.	"	"	"	"	5
T. Chalkley Hatton, Milwaukee, Wis.	"	"	"	"	7
A. J. Hammond, Chicago, Ill.	"	"	"	"	8
Charles H. Paul, Dayton, Ohio	"	"	"	"	9
E. G. Taber, Spokane, Wash.	"	"	"	"	12

Biographical Sketches of Official Nominees for Offices to be Filled at the Annual Election, January 20, 1926

George Stewart Davison

(Official Nominee for President)

Born, September 21, 1856, Pittsburgh, Pa. (Rensselaer Polytechnic Inst., C. E., 1878)—Prior to 1882 in Eng. Depts., Penn. Lines West and Atchison, Topeka & Santa Fe R. R., and with U. S. Engr. Dept. on Western and Southern Rivers: 1882-1892, Chf. Engr., Pittsburgh, Chartiers & Youghiogheny Ry. and Affiliated Cos.: Jan. 1890-Jan. 1900, member of firm of Wilkins and Davison, Engrs., Pittsburgh, in personal charge of that part of firm's work relating to street railway and steam railroad location and construction, and bridge and water-works construction: 1900 to date Executive and Cons. Engr. for number of important corporations: at present, Member of Eng. Committees of the Pittsburgh Flood Comm. and of the Citizens Committee on City Plan of Pittsburgh; Member, City Planning Comm.; and Chairman, Dept. of City Transit of City of Pittsburgh.

Allen Hazen

(Official Nominee for Vice-President)

Born August 28, 1869, Hartford, Vt. (Three years at New Hampshire State Coll.; one year at Mass. Inst. Tech.; New Hampshire State Coll., Sc. D., 1913 (Honorary); Dartmouth Coll., Sc. D. 1917 (Honorary))—1888-1892 in charge, under supervision of the late Hiram F. Mills, Hon. M. Am. Soc. C. E., of the Lawrence Experiment Station, Mass. State Board of Health, on experiments on sewage and water purification: 1893 in Dept. of Water, Sewerage, and Fire Protection, World's Columbian Exposition, Chicago, Ill.: 1894, European travel and student, Dresden Technical Inst.: 1895 to date in private practice, first, in Boston, Mass., later in New York, N. Y.: at present, member of firm of Hazen & Whipple: during past thirty years has been identified with water-works projects throughout the United States, Canada, and elsewhere, including entire new water supplies, many purification works, a few large dams, and numerous other works, as well as a number of valuation and rate cases: author of "Filtration of Public Water Supplies", "Clean Water and How to Get It", "Meter Rates", and chapter on "Water-Works" in American Civil Engineers Pocketbook; co-author with Gardner S. Williams, M. Am.

Soc. C. E., of "Hydraulic Tables"; and contributor to Society and to other technical publications: recipient of Rowland Prize (1900) and Norman Medal (1915), Am. Soc. C. E.: Member, Inst. of Cons. Engrs., Am. Water Works Assoc., New England Water Works Assoc., Boston Soc. of Civ. Engrs., Franklin Inst., etc.

Walter Leroy Huber

(Official Nominee for Vice-President)

Born January 4, 1883, San Francisco, Calif. (Woodland High School, 1901; Coll. of Civ. Eng., Univ. of California, B. S., 1905)—1904-1905, Eng. Staff, Oakland Realty Syndicate, on layout and construction of streets now included in City of Piedmont, Calif.: 1905-1906 structural and hydro-electric design: 1906-1910 Chf. Structural Designer for one of principal firms rebuilding San Francisco after earthquake and fire; also, Chf. Engr. for Superv. Archt., Univ. of California, buildings, bridges, etc.: 1910-1913 Dist. Engr., Dist. 5, U. S. Forest Service, in charge of all engineering work for Forest Service in California and Southwestern Nevada: 1913 to date, in private practice as Cons. Engr. on hydro-electric power and irrigation developments, structural design, and construction: Member, Cons. Board, Dept. of Public Works, State of California, since 1921: President, Sierra Club, San Francisco.

Frank Martin Williams

(Official Nominee for Director, District No. 3)

Born April 11, 1873, Durhamville, N. Y. (Oneida High School, 1890; Colgate Univ., A. B. 1895; Syracuse Univ., Coll. of Law, LL. B. 1897; Colgate Univ., D. Sc. 1915 (Honorary); Syracuse Univ., M. C. E. 1919 (Honorary))—1897 Rodman, canal construction, New York State Engr.'s Dept.: 1898-1899 member of contracting firm, A. L. Norton & Co., on Metropolitan Water System, Boston, Mass.: 1899-1900 Res. Engr. in charge for Stanwix Eng. Co. of construction of water and electric lighting systems, Charlotte, N. Y.: 1900-1908 Rodman, Leveler, Asst. Engr., First Asst. Engr., and Res. Engr., New York State Engr.'s Dept., in charge of plans and specifications for several hundred miles of State highways, including Storm King Highway, and construction of highways costing several million dollars; also, plans, specifications, and construction of river improvement on Neversink and Delaware Rivers: 1909-1910 State Engr. and Surv., New York State, in charge of highway construction and $101 000 000 Barge Canal construction; Chairman, New York State Barge Canal Terminal Comm. (investigation of water terminals in United States and Europe; recommendations with plans for Terminal System, New York State Barge Canal): 1911-1912 Vice-Pres. and Chf. Engr., Coleman DuPont Road, Delaware (surveys, plans, and partial construction of Gen. DuPont's gift of highways to the State of Delaware): 1913-1914 Chf. Engr., Portage County Improvement Assoc., Ohio (surveys, plans, and construction of improved highway system): 1915-1922 elected four times State

Engr. and Surv., New York State, in charge of construction and completion, New York State Barge Canal and Terminal System, involving cost of approximately $160 000 000: during the World War, Eng. Member, New York State Council of Defense: 1915-1922 Member, New York State Water Control Comm. charged with stream regulation throughout the State, including authority to grant or withhold permission for construction of dams more than 10 ft. in height for municipal water supply and for power purposes: 1918-1922 Member, New York State Hospital Development Comm. which presented comprehensive plans for re-adjustments of institutions for the insane and feeble-minded, including plans for new structures: 1919-1922 Member, New York State Bridge and Tunnel Comm. charged with construction of Vehicular Tunnel between New York, N. Y., and Jersey City, N. J.: 1921-1922 Member, New York State Water Power Comm. (This Commission has authority for licensing development for hydro-electric purposes on State streams, including boundary streams): 1923 to date Cons. Engr., New York State Bridge and Tunnel Comm., Hudson River Regulating Dist., Oswego Water Service Comm., Utica Gas & Electric Co., Cohoes Power & Light Corporation, Niagara, Lockport & Ontario Power Co., and Power Corporation of New York; has also made reports to various companies on hydro-electric and other projects.

Donald Hubbard Sawyer

(Official Nominee for Director, District No. 5)

Born August 26, 1878, Mt. Pulaski, Ill. (Oak Park, Ill., High School, 1897; Univ. of Illinois, B. S., 1902)—Sept. 1897-Sept. 1898, Draftsman and Office Asst. to Alvord and Shields, Cons. Engrs., Chicago, Ill.: summer of 1899, Asst. in office of Alvord and Shields: summer of 1900, Asst. with Iowa Eng. Co., Clinton, Iowa, on design and supervision of construction work: summer of 1901 with Ozark & Cherokee Central Ry., Fayetteville, Ark., as Draftsman on location and construction: May-Aug. 1902, with Alexander Potter, Cons. Engr., New York, N. Y., on supervision of intercepting sewer system serving several cities in New Jersey: Aug.-Nov. 1902, with New Jersey Central Ry., in charge of precise survey of terminal, Jersey City, N. J.: Nov. 1902-April 1903, in supervisory charge of drainage, sewers, water systems, grading, ventilation, heating, and plumbing of Johnson City, Tenn., Home for Disabled Volunteer Soldiers: April 1903-April 1904, City Engr. and Supt. of Water and Light Depts., Paris, Ill.: April 1904-Mar. 1908, with Illinois Traction System as Chf. Engr. of Construction, securing franchises, examination of properties, and other executive work: Mar. 1908-June 1917, member of firm of Sawyer Brothers, Engrs., with offices in Seattle and Spokane, Wash., on the design and supervision of irrigation works, power development, sewers, highways, water systems, railway, and other construction activities: June-Dec. 1917, Maj., Quartermaster Corps, as Constr. Quartermaster on the construction of the original Camp Grant, Rockford, Ill.: Dec. 1917-Aug. 1918, Lt.-Col., Quartermaster Corps, in supervisory charge of building storage warehouses in various parts of the United States: Aug.-Dec. 1918, in charge of

construction, U. S. Nitrate Plant No. 2, Cincinnati, Ohio: Dec. 1918-June 1919, Const. Quartermaster, in charge of building Camp Bragg, Fayetteville, N. C.: June-Oct. 1919, in supervisory charge of settling accounts of the Constr. Div.: discharged from the Army, Nov., 1919, and commissioned Col., Quartermaster Reserve Corps, in 1921: Nov. 1919-Jan. 1922, with James Stewart Co., Contrs., New York, N. Y., on building enterprises of that firm: Jan. 1922-Jan. 1923, associated with Frank N. Goebel, Inc., on construction in Westchester County, New York: Jan. 1923 to date, Secy., Associated General Contractors of America, Washington, D. C.

Thomas Chalkley Hatton

(Official Nominee for Director, District No. 7)

Born August 11, 1860, Chester County, Pa. (Maplewood Inst., Concordville, Pa., 1878; Pennsylvania Military Coll., M. C. E., 1916 (Honorary))—1878-1882 Instrumentman and Res. Engr. in charge of construction, St. Paul, Minneapolis & Manitoba Ry. (now Great Northern Ry.): 1883 Hydrographic Engr., Board of Public Works, Dominion of Canada, on survey of Water Hen River and Lake Winnepegosis: 1883-1890 Asst. City Engr., Wilmington, Del.: 1890-1898 Chf. Engr. and 1898-1902 Cons Engr., Street and Sewer Dept., Wilmington, Del.: 1898-1914 in private practice as Cons. and Superv. Engr. for many municipalities and industries throughout the Eastern, Southern, and Middle Western States, with special attention to street improvements, sewerage systems, water supplies, and sewage disposal: 1914 to date, Chf. Engr., Sewerage Comm., Milwaukee, Wis.: 1921 to date, Chf. Engr., Metropolitan Sewerage Comm., County of Milwaukee, Wisconsin; also private practice as Cons. Engr., in connection with sewage disposal plants of considerable magnitude: Member, Am. Water Works Assoc., Am. Soc. of Military Engrs., Am. Inst. of Cons. Engrs., and Inst. of Civ. Engrs. of Great Britain; Vice-Pres., Am. Soc. for Municipal Improvements; Director, Milwaukee Engrs. Soc.; and President, Milwaukee Section, Am. Soc. C. E.

Alonzo John Hammond

(Official Nominee for Director, District No. 8)

Born April 23, 1869, Thorntown, Ind. (Rose Polytechnic Inst., B. S. 1889; M. S. 1894; C. E. 1898; Post-Graduate Student in Civil Eng., 1890-1891, Mass. Inst. Tech.)—1891-1898 Municipal Engr.: 1898-1901 Asst. Engr., Chf. Engr.'s Office, Vandalia Ry.: 1901-1909 City Engr., South Bend, Ind.; also Chf. Engr. Northern Indiana Ry. and Southern Michigan Ry.; in charge of location, design, and construction, interurban railways, and also of reconstruction of city lines; Bridge Engr., St. Joseph Co., designed and supervised construction of eight bridges over St. Joseph River: 1910 Cons. Engr., City of Chicago, Ill., on 73d Street Intake Water Tunnel: 1910-1911 Chf. Engr., Bureau of Public Efficiency, Chicago: 1912-1913 Engr. in Charge of Bridges and Harbors, City of Chicago; bridges designed at this time were the double-

deck bascule at Lake Street, the Michigan Avenue double-deck bascule, Chicago Avenue, Belmont Avenue, etc.; organized construction force and built a number of fixed bridges by day labor: 1914-1922 Cons. Engr. and Asst. Chf. Engr., Chicago Union Station, on design and construction of $75 000 000 railway passenger terminal for the Pennsylvania-Burlington-St. Paul Rys.: 1922 to date Chf. Engr., J. O. Heyworth, Inc.: author of Reports on Water Supply and Tests of Air-Lift Pumps at South Bend, Ind.; on Design and Construction of Southwest Lake and Land Tunnels, Chicago, Ill.; on Electrolysis of Water Mains, Pavements, Power Plants, and Construction Operation of Three Major Park Systems of Chicago: Member, Board of Mgrs., Rose Polytechnic Inst.; Past-President, Illinois Section, Am. Soc. C. E.

Charles Howard Paul

(Official Nominee for Director, District No. 9)

Born March 10, 1875, Rockport, Mass. (Mass. Inst. Tech. 1892-1895.)—Early work with Rockport Water Co., Boston, Mass., Sewage Dept., and Mass. State Board of Health: 1896-1900 with Mass. Metropolitan Water Board on construction of storage reservoirs, pumping stations, and distribution: 1900-1904 with Bureau of Filtration, Philadelphia, Pa., on design and construction of storage reservoirs, filtration works, etc.; in charge of construction of Belmont Filtration Plant, including sedimentation reservoirs, filter beds, and clear-water reservoir: 1904-1915 with U. S. Reclamation Service as Constr. Engr. on design and construction of dams, storage reservoirs, irrigation systems, power development, and drainage systems in Montana, North Dakota, Idaho, Oregon, and Wyoming; in charge of design and construction of the Arrowrock Dam in Idaho, which is the highest dam in the world: 1915-1925 Constr. Engr., Asst. Chf. Engr., and Chf. Engr., Miami Conservancy Dist., Dayton, Ohio, on design and construction of $30 000 000 flood control project for the Miami Valley, including five large hydraulic-fill dams and river channel enlargement through eight cities, including Dayton and Hamilton: Mar.-Oct., 1924, Gen. Mgr., International Air Races held at Dayton, Ohio; Cons. Engr. on design and construction of various dams and plant layout, plant valuation, etc.: 1925 to date Managing Director, Dayton Industrial Assoc.; Cons. Engr., Miami Conservancy Dist.; and engaged in special consulting practice: author of "Construction Plant, Methods and Costs" (Miami Conservancy Dist.); chapter on "Dam Foundations" in "Foundations and Abutments" (McGraw-Hill); "Temperature Changes in Mass Concrete" and "Core Studies in Hydraulic-Fill Dams of the Miami Conservancy District" (*Transactions*, Am. Soc. C. E.), awarded the Norman Medal, Am. Soc. C. E. (1922); and contributions to various technical publications: Past-President, Dayton Section, Am. Soc. C. E., Engrs. Club of Dayton, and Technology Club; Past-Director, Dayton Chamber of Commerce; Director, Moraine Park School; Trustee, Westminster Presbyterian Church and Young Men's Christian Association, Dayton; Member, City Plan Board, Dayton, Rotary Club, and "Hoover" Committee on Standardization of State Mechanics' Lien Laws.

Edward Gray Taber

(Official Nominee for Director, District No. 12)

Born July 14, 1855, Freetown, Mass. (New Bedford, Mass., High School, 1873; Mass. Inst. Tech., 1873-1877.)—March 1880 Rodman, Northern Pacific Ry.: 1880-1888 Asst. Engr., Northern Pacific Ry., on location and construction of main and branch lines: 1888-1889 Res. Engr., Seattle, Lake Shore & Eastern Ry., on location and construction: 1890-1891 Locating Engr., Union Pacific Ry., on branch lines: 1892 Res. Engr., Great Northern Ry., on construction of main line: 1892-1898 Prin. Asst. Engr., Spokane Falls & Northern Ry.: 1899 Asst. and Locating Engr., Oregon Ry. & Nav. Co.; 1900 Asst. Engr., Northern Pacific Ry., on extensions of branch lines: 1901-1903 Asst. Engr., Oregon Short Line Ry., on location and construction of branch lines: 1905 to date, Chf. Engr., Spokane International Ry.

Committee Appointments

Members have been appointed to act for the Society in various capacities as follows:

Public Relations Committee: E. E. Wall, M. Am. Soc. C. E. (succeeds the late Paul H. Norcross, M. Am. Soc. C. E.)

American Engineering Standards Committee, Sectional Committee on Methods of Rating the Water Power of Rivers: C. E. Grunsky, Past-President, Am. Soc. C. E., Olin H. Landreth and Gardner S. Williams, Members, Am. Soc. C. E.

American Engineering Standards Committee, Sectional Committee on Cast-Iron Pipe: F. H. Stephenson, M. Am. Soc. C. E.

American Bureau of Welding, Committee on Welded Joints: George L. Wilson, M. Am. Soc. C. E. (succeeds Howard H. George, M. Am. Soc. C. E., resigned).

Committee with Respect to the Development of the City Planning Features of Washington, D. C.: Morris Knowles, Harland Bartholomew, C. B. Ball, A. B. McDaniel, C. M. Spofford, and J. H. Van Wagenen, Members, Am. Soc. C. E.

Delegate to the 100th Anniversary of Die Technische Hochschule Fridericiana zu Karlsruhe, at Karlsruhe, Germany, on October 28-31, 1925: H. de B. Parsons, M. Am. Soc. C. E.

Arch Dam Investigation—Proposed Details

Tentative plans for the actual conduct of the experiments on the arch dam at Stevenson Creek, California, which project is already favorably known to engineers, are now matured. The range and particulars of the tests are here given in detail for the constructive criticism of interested members.

Scope of Experiments

The object of the experiments is to furnish information on the distribution of strains and stresses in an arch dam under various load and temperature conditions.

The test dam will be as large as some arch dams in actual use and built of the same kinds of materials. To obtain equally complete data from dams built for service and operated under usual conditions would require many years. In fact, it would hardly be feasible to get the needed information in this way, because the desired combinations of water level in the reservoir, temperature, and other conditions, could not be regulated in accordance with a program of tests. On the other hand, such observations as can be made on service dams will become more valuable when compared with those on the test dam.

Information is sought on the following subjects: (1) Proportion of water pressure supported by horizontal arching and by vertical cantilever, beam, or other action; (2) theory of elastic arch as applied to the horizontal arch elements of arch dams; (3) secondary arching in interior of thick arches; (4) "cylinder stresses" in thick arches are greater at intrados than at extrados; (5) arching in inclined planes; (6) variation from uniformity of stress on the horizontal arch elements between arch crowns and abutments; (7) temperature changes in dam, both uniform and variable, from up-stream to down-stream face; (8) relation between temperatures of air and water, and of concrete of dam; (9) shrinkage due to setting of concrete; (10) swelling due to moisture in concrete; (11) flow of concrete under sustained load; (12) effect of lateral deformation (Poisson's law); (13) wedge action near base; (14) ordinary theory of flexure not strictly applicable to a triangular cantilever; (15) vertical cantilevers or beams assumed to be contained between parallel instead of radial planes; (16) deformation due to shear in cantilevers or beams; (17) effect of open construction joints or vertical cracks (three-hinged or multiple-hinged arches partly restrained); (18) effect of horizontal cracks upon stress distribution in vertical cantilevers or beams; (19) effect of water pressure in open horizontal cracks or construction joints (uplift); (20) yielding of foundation horizontally and vertically; (21) yielding of arch abutments; (22) effects of various minor influences; (23) indications as to proper construction methods, especially uniformity of concrete, preparation of horizontal construction joints, arrangement of vertical construction joints, and difference of age of successive horizontal portions of dam due to interruptions in placing concrete.

Extensive laboratory tests will also be made for determining various physical properties of the concrete used in the test dam such as: (*a*) Ultimate strength of concrete and strength at elastic limit in compression and in bending; (*b*) coefficient of rigidity; shear modulus; (*c*) relation of stress to longitudinal deformation, or modulus of elasticity; (*d*) coefficient of thermal expansion; (*e*) coefficient of moisture-absorption expansion; (*f*) relation of lateral to longitudinal deformation under longitudinal load only (Poisson's ratio), and also bi-axial loading; (*g*) relation of plastic deformation (flow) to stress and to

time; (*h*) shrinkage due to setting of concrete, and to drying after having been wet following setting.

Concrete Arch Dams

1.—Statical Conditions.—The exact determination of stresses in an arch dam is a complicated problem. At first glance, the design of a circular arch under water loads appears to be simple; but the effects of complete or partial restraint at the base and along the sides, unproportional deflections at different points, temperature changes, and other variable factors, render the intelligent designing of a dam very difficult. For facility of mathematical analysis, it is customary to consider an arch dam as made up of arch rings and other ideal elemental parts, although in reality it is monolithic or is divided into a few large blocks by construction joints.

If, for instance, the bottom of an arch dam is rigidly held against displacement by the foundation rock, the lowest part of the dam will not be subject to arch stresses. Successive parts above the bottom will be partly restrained, with the result that they will be only partly stressed as arches, the remaining load being carried by vertical cantilever action, or otherwise. If the base of the dam at all elevations is held against longitudinal displacement only and not against rotation, the part of the load not carried by direct arch action will be distributed by vertical beam action, or otherwise, partly to the foundation and partly to other arch rings. If the base of the dam is held against rotation, by the weight of the dam, or by the bond between the concrete and bedrock, or by steel anchors, the distribution will be by cantilever action or by a combination of cantilever, beam, and other action. Additional complications may result by the arch and beam resistance in planes other than horizontal and vertical.

The shape of the canyon may have a marked effect on the distribution of the stresses in the dam. Thus, in a dam located in a V-shaped canyon, a different distribution of the stresses will take place from that in a dam built in a canyon of U-shape, or of irregular shape, even if the height, thickness, span at crest, and radii at corresponding elevations, should be the same.

2.—Temperature Effects.—The computation of stresses in an arch dam is further complicated by the various changes of temperature. If the temperature rises uniformly throughout the concrete the dam will deflect up stream; if the temperature of the concrete is lowered the dam will tend to deflect down stream. Such movements introduce bending stresses which are added to the stresses produced by the water load. The determination of temperature stresses is difficult, even if the temperature change is uniform throughout the mass. Generally, there will be a difference between the temperature on the water and on the air side of the dam. Little is known thus far about the law of variation of temperature in the interior of a dam and of the resulting stresses.

3.—Setting Shrinkage of Concrete.—The hardening and drying out of hydraulic cement concrete is accompanied by a reduction in volume, usually called "setting shrinkage." The effect is similar to the effect of a decrease of temperature, and may be partly or completely offset if the concrete again becomes water-soaked.

4.—Modulus of Elasticity.—Much information on the modulus of elasticity of concrete has been accumulated. If this modulus were accurately known, it would be possible to determine stresses by measurements of strains and deformations under load. The modulus of elasticity of the concrete used in the test dam will be determined by special laboratory tests.

5.—Plastic Flow of Concrete.—It is well known that concrete which is subjected for a long time to heavy loads will yield permanently without appreciable reduction in strength. Heavily stressed concrete "flows" somewhat like pitch under pressure. This "flow," occurring in arch dams, may exert a profound influence on the distribution of stresses. Whether concrete will "flow" appreciably in tension as well as in compression is not yet definitely established.

6.—Lateral Expansion (Poisson's Ratio).—Concrete which is compressed in one direction, as in a column, deforms somewhat laterally in accordance with a law generally known as "Poisson's ratio." The influence of this lateral expansion on the distribution of the stresses of an arch dam may be considerable, especially in very high dams. The law of lateral expansion is fairly well known, if a concrete block is loaded in an axial direction; but little is known about this lateral deformation if the concrete is stressed simultaneously in two or more directions, as in a dam.

7.—Theory of Elasticity.—It may be assumed that within the limits of stresses usual in dams, the laws of elasticity will hold, subject to such modifications as may result from plastic "flow" of concrete, Poisson's ratio, and other influences.

Proposed Experiments on Test Dam

In order to determine the distribution of the stresses in the proposed test dam, special arrangements will be made for measuring the strains, deflections, and temperature changes at as many points as practicable. The tests will be conducted under a great variety of conditions as to loads and temperatures. Many tests will be repeated for checking purposes.

In order to avoid complications due to irregular profile, the excavations for the test dam will be prepared so that the profile of the base will be symmetrical and as regular as possible. The up-stream face of the dam will be vertical and of uniform curvature throughout. The water pressure, therefore, will be exactly radial and of uniform intensity in any horizontal plane.

1.—Strain-Gauge Measurements.—At accessible positions the strains will be measured by a strain gauge, or a similar device. On the up-stream face, below the water level, and in the interior of the concrete, electric tele-strain gauges of the carbon resistor type, developed by the U. S. Bureau of Standards, will be used. It is believed, if the modulus of elasticity of the concrete is known, that the proposed arrangement will permit of the calculation of stresses in every direction on the surface and in the interior of the dam.

In order to obtain proper relations among the measurements taken at different times, a reference bar kept at the temperature of melting ice will be used at intervals for determining possible influence of temperature changes on the strain gauge.

The electrical carbon resistor strain gauges located on the up-stream face and in the interior of the dam may be read at a convenient place a short distance from the dam. At some positions practically simultaneous measurements will be made with more than one kind of instrument for comparison.

2.—Temperature Measurements.—Each carbon resistor strain gauge will be provided with a thermometer of the electric resistor type. Temperature variations of the concrete, therefore, can be measured at all points where the carbon resistor strain gauges are located. There will be more than one hundred of these instruments in and on the dam.

3.—Deflection Measurements.—Deflections will be measured in three vertical sections. Inasmuch as these deflections will be small, especially at points at short distances above the foundations, special measuring towers are to be provided. The deflections near the foundation are to be measured with a strain gauge; at higher elevations, by a graphic device. Movements of the towers will be measured by sighting with a transit across the canyon at the 60-ft. elevation, and probably in other ways. Deflections of the crest of the dam will also be checked by sights between fixed stations on both sides of the canyon. In this manner, the permanent yield of the arches may also be determined.

Deflection measurements will also be made in a number of vertical cross-sections on the down-stream face of the dam in the following manner: Bolts will be set in the concrete about 5 ft. apart vertically. The inclination of the lines between each two successive points will be measured by a clinometer. When the dam is deflected, due to water pressure, temperature, or other causes, the changes in inclination of the lines between the bolts can be determined easily and accurately. The linear horizontal displacements of the various bolts, that is, the deflection of the dam, can then be calculated readily.

At suitable time intervals, the elevations of a number of points along the crest of the dam will be accurately measured with a level in order to determine displacements in a vertical direction, due to temperature or other changes. Attempts will also be made to measure the elastic deformations of the bed-rock which may result from the loads imposed by the dam and by the water in the reservoir.

4.—Laboratory Tests.—While the test dam is being built, a large number of concrete specimens will be cast from the batches of concrete used in the dam. Some of the laboratory tests will be made in a room near the dam site. For the more refined tests, the specimens will be sent to the Engineering Laboratory of the University of California, in Berkeley, which will be specially equipped for this investigation. Certain special investigations will also be made at the California Institute of Technology, in Pasadena.

General Program of Tests

During construction of the dam, certain instruments and other accessories will be placed at pre-determined points, readings will be taken at frequent intervals for determining stress and temperature, and care will be exercised that no water accumulates in the reservoir. A diversion tunnel of ample capacity will by-pass all the flow in the creek.

As soon as the dam is completed and the forms have been removed, a complete set of measurements on all instruments will be made. Similar measurements will be repeated once or twice so as to furnish a secure basis for comparison with conditions found during the later stages of the experiment.

After 7, 28, 60, and 90 days from the initial measurements, complete series of readings on all instruments will be taken. The thermometers will be read daily, or at such intervals as may be found to be desirable.

About three months after completion of the dam, and when the concrete has attained considerable strength, the dam will gradually be put under pressure by partial filling of the reservoir from the power tunnel. On the occasion of the first loading tests, the "no-load" condition will first be carefully determined. Then water will be permitted to flow into the reservoir to a depth of 10 ft. at the dam. Deflections and stresses due to this load will then be measured.

The next step will be to let the water rise to a depth of 20 ft. at the dam, when a new series of observations will be made. The process will be repeated with the water surface at the 30-ft. elevation, etc., until the instruments indicate the possibility of stresses dangerous for the green concrete. Then the water will be let out gradually, and a new series of measurements will be taken when the water surface has reached the 20-ft., 10-ft., and zero elevations. This will determine whether the dam returns to the original position, or whether a permanent set has taken place.

Experiments will be repeated at 30 or 60-day intervals for about one year, especially to study the influence of summer and winter temperatures. Individual test series may be repeated for checking purposes as often as desired.

In order to determine the plastic "flow" of the concrete, the water will be permitted to rise in the reservoir at such a rate that the dam will come under full pressure in the course of one or two weeks. The reservoir will then be kept full for a period of, say, thirty days, and deflection and stress measurements made at suitable time intervals to establish how much of the deformation is elastic and what percentage is permanent set.

At certain times during the testing period, the dam will remain empty to permit the concrete to dry out. A number of strain and deflection measurements taken during this period will show the influence of temperature alone. Many other combinations of load and temperature conditions may be made during the testing period, which is expected to last about one year.

After all possible information has been obtained from the 60-ft. dam, the dam will be raised in steps of 10 ft. each and tested as before. The dam will ultimately be raised to a sufficient height to cause failure, if practicable.

Theoretical Interpretation of Test Results

If it is possible by means of the apparatus which will be placed on and in the dam to determine stresses and deflections at a great number of points with the necessary degree of accuracy, it should then be feasible to establish definitely what proportion of the water pressure and temperature loads acting on this dam is resisted by the weight of the dam (gravity or cantilever or beam

action) and what proportion is carried by the arch elements. Information should also be gained on the influence of temperature, shrinkage, and other phenomena affecting the stress distribution in an arch dam.

The theory of concrete arch bridges has been developed and tested by many observations on full-sized structures. Great progress was thereby made possible in bridge design. It is to be hoped that, similarly, experiments on the test dam will lead to a clearer understanding of the static conditions of arch dams, and to the proof or development of a theory by which future dams may be designed and built with an added degree of safety and economy.

Comments on the foregoing are invited and may be sent to H. Hawgood, M. Am. Soc. C. E., Chairman of the Sub-Committee on Test Dam, 722 H. W. Hellman Building, Los Angeles, Calif., or to Engineering Foundation, 29 West 39th Street, New York, N. Y. The Committee will be glad to have the benefit of immediate suggestions.

Colorado Engineering Council Active in Public Affairs

What seems to be a unique move has been initiated by the Colorado Engineering Council, an affiliation of various engineering organizations in that State. The Council has recently undertaken a service of technical advice to the City of Denver, in the appointment of several engineering committees composed of men particularly versed in individual civic problems. These committees will provide unified and acknowledged authorities to which the city can appeal for unbiased information.

One committee on the Moffat Tunnel, which is of vital importance to Colorado, will consider the many phases of mining, tunneling, road construction, electrification, and hydraulics involved in this gigantic construction work. Still another committee will deal with the Denver water supply, utilizing its wide acquaintance with the water resources of the eastern slope of the Rockies. Another lively topic relates to trans-mountain water diversion; this committee will assist the city in maintaining its present water rights and in acquiring additional ones. A committee on flood control will have the advantage of studying the methods and accomplishments in the neighboring City of Pueblo. Still another committee will consider the question of city planning in its broader aspects with the many inter-related engineering questions involved.

While the advisory assistance of many prominent engineers is offered generously to the city, it is not anticipated that the detailed professional work is to be donated gratuitously. Colorado Engineering Council takes the attitude that the city should have the benefit of expert technical advice before undertaking detailed projects involving extensive improvements. In this way, the engineers of Colorado—and this includes the Colorado Section of the Society—are pointing the way to real public service and are effectively deserving and gaining public esteem.

Associated General Contractors Issue Manual

The Manual recently issued by the Associated General Contractors of America will greatly interest every contractor and not a few engineers. The

various forms and instructions relating to them will prove invaluable to an organization doing construction work. These cover the subjects of equipment, financial statement, estimate, overhead, bond, overhaul, and similar practical details. In addition, there are forms of contract, articles on construction, and accounts of the activities of the Association. The comprehensiveness of this Manual in its loose-leaf form will appeal to all who are interested in construction. The Associated General Contractors of America, 1038 Munsey Bldg., Washington, D. C., are distributing this Manual direct at a cost of $5 postpaid.

Georgia Section Drafted for Public Service

An example of the standing of the Society and its Local Section in Georgia is furnished by the action of the Governor of Georgia during the past summer in requesting the Georgia Section to supply a committee to study the work and finances of the State Highway Department. In making this request Governor Walker pays a gratifying compliment to the Local Section and to Civil Engineers. He says, "Knowing the high standard of professional ethics that your Society requires of its members and their familiarity with technical and economic matters, I feel sure that a study by such a committee would furnish an unbiased report that would give to me and to the citizens of the State constructive suggestions that would be of great value."

The Committee as appointed by Frederick H. McDonald, Assoc. M. Am. Soc. C. E., President of the Georgia Section, includes the following: James H. Johnston, *Chairman,* C. A. Smith, and B. M. Hall, Members, Am. Soc. C. E.

The position of the Georgia Section is fortunate in that it commands to so great an extent the confidence of officials and of the general public. It is drafted for public work not only because it is known to be capable but because it is willing to serve.

Employment Service Expands to Chicago

The expansion of the Engineering Societies Employment Service to embrace an office in Chicago, Ill., has long been an ideal. It is now an accomplished fact, thanks to the co-operation of the Western Society of Engineers with the four Founder Societies. This means a broadening of the scope of the work and at the same time an intensifying of its value to engineers in the Middle West. It makes possible the same immediacy of service as Eastern engineers previously enjoyed. Best of all it marks a distinct forward step in the usefulness of the Societies—a larger, more personal return to a greater number of members. The success of the Chicago Office depends mostly on the interest and active help of those it is intended to serve. Whether you want a position, want to find engineers for a vacancy, or simply want to become acquainted with the facilities, you will be most welcome at the new offices, 1736 Monadnock Block, 53 West Jackson Boulevard, Chicago, Ill.

Brashear, the Star Gazer*

From time immemorial there have been star gazers and most of them have been considered of "no account". Even the ancient Hebrew king—shepherd boy, poet and bard as well—had no false illusions on that subject when he wrote, "When I consider Thy heavens, * * * the moon and the stars which Thou hast ordained; what is man * * *?" Doubtless this was what many of John Brashear's acquaintances thought of his hobby; "Well, it didn't do any harm and he got lots of fun out of it!" Meanwhile this hobby not only became the ruling motive of his life but lifted him to accomplishment, to notoriety—so that Brashear's name ("Uncle John" he was called by thousands of people) became known the whole world round, on the lips of scientists and rulers, a name to conjure by.

Like every great activity, it all started in a small way—a poor hard-working millwright, expert but visionary, with one consuming love, to study the starry heavens. Upon such an insecure basis was a great achievement wrought!

Early in his married life—and in all his astronomical successes "Ma" Brashear was a full partner—he had borrowed a small telescope. Not satisfied with that he had made a larger lens (5-in.) and constructed an instrument of his own, using a small workshop in the back yard of his modest home in Pittsburgh fitted with a boiler, an engine (his own design), a lathe, etc. This work occupied three years, evenings and holidays. Even his home had to make its sacrifice to this precious instrument when he dismantled his roof to accommodate a crude observatory. Here every clear night would find him accompanied by his wife, studying the heavens, tracing the luminous orbits one by one. Here his neighbors also would discover him and would sit enthralled as he unfolded his knowledge and inspired them with reflected enthusiasm.

The next event in Brashear's career—his experience in making his first reflector—is typical of him. It was not to be expected that he would long remain satisfied with the original telescope. Excellent though it was he soon exhausted its range and aspired for other worlds—literally—to conquer. Meanwhile he had made the acquaintance of that noted scientist, Professor Samuel Pierpont Langley (it became a lifelong friendship) and through him had become imbued with the ambition for a reflecting telescope. Here his manual expertness stood him in good stead; he could not purchase a reflector such as he wanted so he resolved to make it. That 12-in. mirror became, for the time being, the aim of his existence. His daily work was merely incidental—a means that permitted him to live while he devoted his real energies to his reflector. Every night he worked at it, until the nights became weeks and the weeks months and the months stretched almost to a year. He ground the glass to a curved surface, smoothed it, and polished it until at last it satisfied even his critical taste. He tested it exhaustively using his cellar for a laboratory. At last the great night arrived when he was to silver it. He came home to find that "Ma" already had preparations

* Material for this sketch was obtained from Brashear's autobiography published by the American Society of Mechanical Engineers, 29 West 39th Street, New York, N. Y.

started for heating the solution which was to give his lens its magic mirror. At last the arrangements were complete, the crucial moment arrived, the hot solution was applied. Part of the glass had already assumed a beautiful silver surface when suddenly it cracked from the edge to the middle.

John Brashear wrestled all night with his anguish. He thought of the many months of toil, of the wasted labor and of the fact that the planet Mars would not for years be in as good a position for observing. Next day at the shop he worked in a daze. Before supper he was taken by his wife to the workshop to find everything shipshape, steam up and a second disc in the lathe ready for grinding. Her pluck restored his shaken confidence and steeled his resolve. In two short months the new reflector was ready for silvering. Meanwhile he had experimented with silvering methods and had perfected one already in use, thereafter known as the "Brashear process". There was no second failure; the Brashears of science do not repeat a mistake.

Little did Brashear realize that this reflector with its tedium, its discipline, and its final success was to point him to his real life work. He undertook to serve other amateur astronomers as he had served himself; he was deluged with orders; and finally he gave up his mill position and devoted all his energies to making precision apparatus. As Langley, a great astronomer, had been his scientific inspiration, so William Thaw, a great philanthropist, became his business "angel" and gave him the much needed financial advice and assistance. Thus it was that within a few years he was noted. His reputation was attained.

What Brashear later became—intimate of eminent scientists and magnates, manufacturer of renown, recipient of international honors, holder of doctors' degrees from half a dozen nationally known institutions, Acting Chancellor of a great university, President of the American Society of Mechanical Engineers, bearer of the official designation, "Pennsylvania's most distinguished citizen"—these were simply incidental to his first success. He made other famous lenses and reflectors but none gave the thrill of that first one. Into it went his earliest and utmost efforts and from it developed fame in the same degree. Among the monuments he left perhaps the most fitting is the new Allegheny Observatory in Pittsburgh, which he labored unremittingly to establish. There lie the remains of "Uncle John" and "Ma" Brashear. On the simple tablet bearing their names is inscribed one sentence:

"He loved the stars too fondly
To be fearful of the night."

Who shall say that a hobby which carries a man beyond himself is illusory? Let such a critic mark well the career of John Brashear. He hadn't "education", he hadn't influence, he hadn't money; but he did have ambition and tenacity and a goal. He hitched his wagon to all the stars and they brought him friends, fame, and happiness. In the record of life John Brashear, the star gazer, will not be estimated as of "no account"; his name is linked, undying, to the stars he loved.

Local Sections*

Colorado.—August 3, 1925. Following a dinner at 6:30 P. M., the 146th regular meeting was held at the University Club, Denver, at 8:00 P. M. W. W. De Berard, a member of the Engineering Board of Review of the Sanitary District of Chicago on the Lake Lowering Controversy and a Program of Remedial Measures, presented an historical sketch of the efforts of the City of Chicago to dispose of its waste down the Mississippi River by way of the Drainage Canal instead of into Lake Michigan from whence its water supply is drawn. Three reels of motion pictures were shown depicting graphically the action of the intercepting sewers, the construction of the Drainage Canal, and the location and design of the disposal works built to date. Slides and photographs added to the well-balanced discussion.

At the invitation of Frederick H. Weed, Resident Engineer for James H. Fuertes, M. Am. Soc. C. E., on the Marston Lake Filter, the members of the Section decided to make an inspection trip to the plant on August 8.

Midsummer business was postponed until the September meeting, but letters received from Mrs. C. H. Howell thanking the section for roses sent to Mr. Howell, who is ill, and from G. F. Maitland, Second Vice-President and Assistant Treasurer of the Kansas City Bridge Company, Kansas City, Mo., complimenting the Section on the dinner to President Ridgway and extending an invitation to its members to stop over in Kansas City, were read. Attendance 30.

Portland (Ore.).—June 26, 1925. A dinner meeting was held at the University Club, with Secretary George T. Seabury as the guest of honor. Mr. Seabury addressed the Section on the various activities of the Secretary's office and gave an analysis of the annual expenditures of the Society. The other speakers were Director G. C. Mason, who reported on the activities of the Student Chapters, and Mr. J. C. Stevens, who discussed the Scholarship Fund sponsored by the Oregon Technical Council. Attendance 28.

June 27, 1925. Secretary Seabury with six members of the Section made the trip over the Columbia River Highway as far as Horsetail Falls. In the evening, Mr. Seabury and sixteen members made an inspection tour of the harbor, the dry docks, and of Terminal No. 4, where supper was served.

June 28, 1925. Seventeen members of the Section and guests, including Secretary Seabury, visited the Portland Electric Power Company and inspected the Oak Grove Plant.

Sacramento.—July 7, 1925. Glenn L. Weber, of the Pacific Telephone and Telegraph Company, gave an illustrated talk on "Telephotography". This was the 100th regular meeting of the Section. Attendance 23.

July 14, 1925. Harlowe M. Stafford, Water Supervisor of the Sacramento and San Joaquin Rivers for the State Department of Water Rights, addressed the members on the work of his Department. Attendance 25.

* For list of Local Section Officers, Rules, etc., see 1925 Year Book, p. 48.

August 4, 1925. Walker R. Young, Engineer of the U. S. Reclamation Service, in charge of the surveys and investigations for a salt-water barrier at the mouth of the Sacramento River, described the work being done. Attendance 32.

August 11, 1925. Louis H. Northrop, General Manager of the Sacramento Gas Company, addressed the Section on "Natural Gas". Attendance 22.

August 25, 1925. Mr. S. H. Searancke gave an interesting talk on his recent visit to Ireland. Attendance 17.

San Francisco.—June 23, 1925. After a dinner held at the Hotel St. Francis at which 97 members and guests were present, a business meeting was held. Past-President C. E. Grunsky made a few remarks on the Annual Convention of the Society at Cincinnati, Ohio; and Director Henry D. Dewell spoke on the Conference of Local Section Representatives at the Convention. Secretary George T. Seabury expressed his pleasure at being present at this meeting and described the personnel and the work at the Headquarters of the Society, giving in detail the manner in which the Society's finances are expended, and also discussing the work of the Engineering Societies Employment Service. M. M. O'Shaughnessy, City Engineer of San Francisco, addressed the meeting on the "Hetch Hetchy Water Supply". He also presented a paper by Nelson A. Eckart, Assistant City Engineer of San Francisco, who was unable to be present, entitled "The Moccasin Power Plant of the Hetch Hetchy Project". Attendance 120.

July 28, 1925.—A special meeting was called in order to discuss the Santa Barbara earthquake. The main addresses were made by Messrs. John D. Galloway, L. H. Nishkian, and H. J. Brunnier, Consulting Engineers of San Francisco. These addresses were followed by a discussion on the subject by Dr. Bailey Willis, President of the Seismological Society of America; W. H. Kirkbride, Engineer, Maintenance of Way and Structures, Southern Pacific Company; and John B. Leonard and Director H. D. Dewell, Consulting Engineers of San Francisco. Attendance 220.

Western Washington.—January 26, 1925. Annual Meeting. After an election of officers for the ensuing year, Thomas B. Hill, Assistant Secretary of the Seattle Chamber of Commerce, gave an illustrated lecture on the scenic beauties of the Olympic Peninsula.

February 23, 1925. L. M. Holt, Supervising Engineer of the U. S. Indian Irrigation Service, Yakima, Wash., gave an illustrated lecture on the operations of the Indian Service in the Pacific Northwest.

March 30, 1925. E. C. Dohm, Chief Engineer of the State Land Office, Olympia, Wash., described fully the extensive and varied activities of the State Land Office from the engineering standpoint.

April 27, 1925. The engineering activities in developing the model city of Longview, Wash., the largest saw-mill in the United States, and extensive railroad and dredging activities incident to the logging operations, were described in detail by Wesley Vandercook, Chief Engineer of the Long Bell Company, of Longview. Attendance 75.

May 25, 1925. G. L. Parker, District Engineer of the U. S. Geological Survey, gave an account of the hydrographic activities of his Bureau in the Northwest. The discussion emphasized the fact that the State of Washington holds the greatest undeveloped water resources in the country, yet the State participation with the Federal Government in stream measurement operations is much less than that of States with less actual interest.

June 28, 1925. Lieutenant J. J. Manning, assisted by Commander W. H. Allen, both of the Puget Sound Navy Yard, described and illustrated the plans and activities at that Navy Yard leading up to the construction of a great pier for the handling of repairs of the largest war vessels.

The Section was also honored by a visit from Secretary Seabury who gave an interesting talk on the activities of the Society and his personal experiences as Secretary.

The attendance at all of these meetings, except that of April 27, 1925, was from 35 to 40.

Engineering Societies Library

The services of the Engineering Societies Library are available to all members who wish searches, copies, translations, etc., or advice on technical literature. A collection of modern books is also available for loan to members in North America, at moderate rentals. Correspondence should be addressed to the Director, Engineering Societies Library, 29 West 39th Street, New York, N. Y., who will gladly give information concerning the charges for the various kinds of work. A more comprehensive statement in regard to this matter will be found on pages 71 and 72 of the Year Book for 1925.

Book Notices*

(August 1 to August 31, 1925)

American Petroleum, Supply and Demand. By American Petroleum Institute, Committee of Eleven. N. Y., McGraw-Hill Book Co., 1925. 269 pp., tab., graphs, 9 x 6 in., cloth. $3.00.

When the Federal Oil Conservation Board was created, the American Petroleum Institute, as an act of co-operation, appointed a committee to investigate the oil industry and oil resources of the nation. The report of that committee is here presented, showing the future supply of oil from wells, oil shale, coal, and lignite, and the probable future demand for oil.

Der Eisenbetonbau; Teil 1. By C. Kersten. Berlin, Wilhelm Ernst & Sohn, 1925. 366 pp., illus., diagrams, tab., 8 x 5 in., cloth. 8.10 gm.

This, the first of three volumes, is intended for students of reinforced concrete construction and for those engaged in building. It presents the subject simply, uses only elementary mathematics, and pays special attention to practical examples illustrating the application of the theory.

Eisenhüttenkunde; Vol. 2, Das Schmiedbare Eisen. By M. v. Schwarz. Berlin und Leipzig, Walter de Gruyter & Co., 1925. 176 pp., illus., diagrams, 6 x 4 in., cloth. 1.25 gm.

This concise text on the metallurgy of wrought iron and steel gives a fairly adequate account both of modern methods and of those of historic interest.

Railroads; Cases and Selections. Edited by Eliot Jones and Homer B. Vanderblue. N. Y., Macmillan Co., 1925. 882 pp., diagrams, maps, 9 x 6 in., cloth. $4.25.

This volume, intended to supplement the textbooks of the authors on railroad transportation and rates, consists for the most part of decisions of the Interstate Commerce Commission, the Railroad Labor Board, and the Supreme Court of the United States.

Sampling and Testing of Highway Materials. By William H. Barton, Jr., and L. H. Doane. N. Y., McGraw-Hill Book Co., 1925. 355 pp., illus., diagrams, tab., 9 x 6 in., cloth. $3.50.

This is a textbook and reference book, in which are given the methods of making the standard and tentatively standard tests for the materials used in road building.

Strength of Materials. By Alfred P. Poorman. N. Y., McGraw-Hill Book Co., 1925. 313 pp., diagrams, tab., 9 x 6 in., cloth. $3.00.

This is a companion textbook to the author's "Applied Mechanics" and contains a large number of illustrative examples with detailed solutions and many problems.

* The statements made in these notices are taken from the books themselves, and this Society is not responsible for them. Unless otherwise specified, the books in this list have been donated by publishers.

Current Civil Engineering Literature

Key to Abbreviated References to Publications Indexed*

Abbreviated References.	Publication.	Place.
Am. C. Inst.	*American Concrete Institute, Proceedings* (Y.)	Detroit
A. I. E. E.	*American Institute of Electrical Engineers Journal* (M.)	New York
A. R. E. A.	*American Railway Engineering Association, Proceedings* (Y.)	Chicago
A. S. T. M.	*American Society for Testing Materials, Proceedings* (Y.)	Philadelphia
Am. Soc. C. E.	*American Society of Civil Engineers, Proceedings* (M.)	New York
Am. Soc. Mun. Impvts.	*American Society for Municipal Improvements, Proceedings* (Y.)	New York
Am. W. W. Assoc.	*American Water Works Association, Journal* (Bi-M.)	Baltimore
Am. Wood Prs. Assoc.	*American Wood Preservers Association, Proceedings* (Y.)	Chicago
Ann. P. et C.	*Annales des Ponts et Chaussées* (Bi-M.)	Paris
Ann. T. P. Belg.	*Annales des Travaux Publics de Belgique* (Bi-M.)	Brussels
Assoc. Ing. Gand.	*Annales de l'Association des Ingénieurs sortis des Ecoles Spéciales de Gand* (Q.)	Ghent
Bost. Soc. C. E.	*Boston Society of Civil Engineers, Journal* (M.)	Boston
Can. Engr.	*Canadian Engineer* (W.)	Toronto
Cornell C. E.	*Cornell Civil Engineer* (M.)	Ithaca
Dock & Harbour	*Dock and Harbour Authority* (M.)	London
Eng.	*Engineering* (W.)	London
Eng. & Contr.	*Engineering and Contracting* (W.)	Chicago
Eng. Inst. Can.	*Engineering Institute of Canada, Journal* (M.)	Montreal
Eng. N. R.	*Engineering News-Record* (W.)	New York
Engrs. Soc. W. Pa.	*Engineers' Society of Western Pennsylvania, Journal* (M.)	Pittsburgh
Engr.	*Engineer* (W.)	London
Engrs. & Eng.	*Engineers and Engineering, Engineers' Club of Philadelphia* (M.)	Philadelphia
Gen. Civ.	*Le Génie Civil* (W.)	Paris
Gesund. Ing.	*Gesundheits Ingenieur* (W.)	Munich
Inst. C. E.	*Institution of Civil Engineers Minutes of Proceedings* (Q.)	London
Inst. Mun. & Co. Engrs.	*Institution of Municipal and County Engineers, Journal* (W.)	London
Int. Ry. Cong. Assoc.	*International Railway Congress Association, Bulletin* (M.)	Brussels
Land. Arch.	*Landscape Architecture* (M.)	Harrisburg
Mech. Eng.	*Mechanical Engineering* (M.) *Journal of the American Society of Mechanical Engineers*	New York
Mil. Engr.	*Military Engineer* (M.)	Washington
Min. & Metal.	*Mining and Metallurgy* (M.) *American Institute of Mining Engineers*	New York
Mun. & Co. Eng.	*Municipal and County Engineering* (M.)	Indianapolis
N. E. W. W. Assoc.	*New England Water Works Association, Journal* (M.)	Boston
N. Y. R. R. Club	*New York Railroad Club, Proceedings* (M.)	Brooklyn
Oest. Ing. Arch. Ver.	*Oesterreichischer Ingenieur und Architekten Verein, Zeitschrift* (F.)	Vienna
Power	*Power* (W.)	New York
Rev. Gen.	*Revue Générale des Chemins de Fer* (M.)	Paris
Ry. Age	*Railway Age* (W.)	New York
Ry. Eng. & Main.	*Railway Engineering and Maintenance* (M.)	Chicago
Ry. Rev.	*Railway Review* (W.)	Chicago
Schw. Bauz.	*Schweizerische Bauzeitung* (W.)	Zurich
Sci. Am.	*Scientific American* (M.)	New York
Soc. Ing. Civ. Fr.	*Société des Ingénieurs Civils de France, Mémoires et Comptes Rendus* (Q.)	Paris
Ver. deu. Ing.	*Verein deutscher Ingenieure, Zeitschrift* (W.)	Berlin
West. Ry. Club	*Western Railway Club, Proceedings* (M.)	Chicago
West. Soc. Engrs.	*Western Society of Engineers, Journal* (M.)	Chicago
Zeit. Bau.	*Zeitschrift fur Bauwesen* (Q.)	Berlin
Z. d. Bauver.	*Zentralblatt der Bauverwaltung* (W.)	Berlin

* Y = Yearly; Q = Quarterly; M = Monthly; F = Fortnightly; W = Weekly.

A. Applied Sciences

a. Processes of Calculation

2. Graphical and Nomographical Processes

Note sur le Raccordement d'une Droite et d'un Cercle, par la Parabole Cubique et la Lemniscate. (Note on the Joining of a Straight Line and a Circle by the Cubic Parabola and the Lemniscate.) E. Minnaert. Assoc. Ing. Gand. Pt. 2, '25.

3. Stresses and Strains

An English Treatment of Continuous Beam Problems.* F. W. Davey. (From *Concrete and Constructional Engineering.*) Eng. & Contr. July 22, '25.

Stresses in Connecting-Rods.* B. B. Low. Eng. Aug. 14, '25.

B. Applied Mechanics

a. Mechanics of Solids (Strength of Materials)

1. Processes of Measurement

Organization of Physical Testing Laboratory.* Can. Engr. July 21, '25.

Limite d'Elasticité et Module d'Elasticité dans les Produits Métallurgiques.* (Elastic Limit and Modulus of Elasticity in Metallurgical Products.) L. Guillet. Gen. Civ. June 27, '25.

Les Essais de Fatigue des Métaux et les Machines Amsler pour leur Exécution.* (Fatigue Tests of Metals and the Amsler Machine for Making Them.) Gen. Civ. July 18, '25.

7. Pulverulent Masses (Earth Pressure)

Progress Report of the Special Committee to Codify Present Practice on the Bearing Value of Soils for Foundations, Etc.* Discussion: S. J. Fortin. Am. Soc. C. E. Aug., '25.

b. Hydraulics

1. Processes of Measurement

Venturi Meters Used in Hydro-Electric Plant Operation.* J. M. Gaylord. Power July 28, '25.

2. Physical Hydraulics

New Formula for Flow of Water in Clean Cast-Iron Pipe.* Edward Wegmann and Albert N. Aeryns. Eng. N. R. July 16, '25.

3. Industrial Hydraulics

La Gabelle Hydro-Electric Development.* S. Svenningson and J. A. McCrory. Can. Engr. July 28, '25.

Practical Problems of Operation.* (3rd Annual Hydro-Electric Conference, Engrs. Club, Pa.) Aug., '25.

High Specific Speed Hydraulic Turbines in Their Bearing on the Proportioning of the Number of Units in Low-Head Hydro-Electric Plants.* A Symposium. George A. Orrok, Lewis F. Moody, Forrest Nagler, George A. Jessop, Charles C. Egbert, and John P. Hogan. Am. Soc. C. E. Aug., '25.

The Mountains Light a City.* Thomas R. Horner. Sci. Am. Aug., '25.

Hydro-Electric Development at Grand Falls.* Can. Engr. Aug. 4, '25.

San Francisco's Hetch Hetchy Power and Water Project.* Power Aug. 18, '25.

Alouette-Stave Lake Hydro Development.* C. E. Blee Can. Engr. Aug. 18, '25.

Ice Troubles in Swedish Power Plants. A. Frey. Samsioe. (From paper read before World Power Conference.) Can. Engr. Aug. 18, '25.

Le Barrage-Réservoir du Sautet, sur le Drac, Isère. Regularisation du Drac Produite par ce Réservoir.* (The Sautet Reservoir Dam on the Drac, Isere. Regularisation of the Drac, Produced by this Reservoir.) E. Dusagey. Gen. Civ. July 4, '25.

Die Schwungpumpe.* (The Oscillating Pump.) Alfred Gratzl. Oest. Ing. Arch. Ver. July 10, '25.

Das projektierte Laboratorium für Wasserbau an der E. T. H. in Zürich.* (The Proposed Hydraulic Laboratory at the E. T. H. in Zurich.) E. Mayer-Peter. Schw. Bauz. July 11, '25.

Das Spullerseekraftwerk der Oesterreichischen Bundesbahnen.* (The Lake Spuller Power Plant of the Austrian State Railroads.) Oest. Ing. Arch. Ver. July 24, '25.

Moderne Dachwehranlagen.* (Modern Shutter Weir Installation.) August Läufer. Oest. Ing. Arch. Ver. July 24, '25.

Beitrag zur statischen Berechnung von Druckleitungs-Festpunkten.* (Contribution to the Static Calculation of High-Pressure Pipe Anchorages.) O. J. Herz. Oest. Ing. Arch. Ver. July 24, '25.

Der neuzeitliche Talsperrenbau.* (Modern Reservoir Dam Construction.) Josef Ornig. Oest. Ing. Arch. Ver. Serial beginning July 24, '25.

C. Materials of Construction and General Processes

a. Lime, Cement, Mortar, Concrete, Brick, Bitumen, etc.

Theory Must Aid Practice in Concrete Making. C. P. Richardson. (From *Proceedings,* Am. Concrete Inst.) Mun. & Co. Eng. July, '25.

The Fundamental Cause of the Distintegration of Concrete.* Alfred H. White. (Paper read before Conference on Highway Eng.) Mun. & Co. Eng. July, '25.

Putting Slag to Work.* Sci. Am. July, '25.

Compression Tests on Concrete. Harrison F. Gonnerman. Can. Engr. July 14, '25.

Some Important Requirements for Good Concrete.* A. M. Bouillon. Ry. Eng. & Main. Aug., '25.

The Effect of Moisture on Concrete.* Discussion: A. T. Goldbeck. Am. Soc. C. E. Aug., '25.

L'industrie du Basalte Fondu.* (The Fused Basalt Industry.) V. Neveux. Gen. Civ. July 18, '25.

b. Metals

Der neue deutsche hochwertige Baustahl "St. 58". (The New German High-Grade Structural Steel, "St. 58".) M. Ros. Schw. Bauz. Serial beginning July 25, '25.

c. Preservation and Use of Materials, Painting, Waterproofing

Tests of Some Rust-Preventing Materials Suitable for the Protection of Stored Machinery.* C. Jakeman. Eng. July 31, '25.

f. Rock Excavation. Mining. Rock Removal

Abstract of Institute Papers.* A. I. M. E. Aug., '25.
Abraumförderbrücken im Braunkohlentagebau.* (Over-Burden Conveyor Bridges in Open-Cut Lignite Mining.) W. Ries. Ver. deu. Ing. July 18, '25.

g. Execution of Works. Specifications

Live-Loads for Building Design: Recommended Standards. (From Report of Comm. of Dept. of Commerce.) Eng. N. R. Aug. 6, '25.
Working Stresses in Framework of Buildings: Tentative Proposals. (From Report of Comm. of Dept. of Commerce.) Eng. N. R. Aug. 6, '25.
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1. Of Masonry

Trockenlegung feuchter Mauern durch strömende Luft.* (Dry Building of Damp Walls by Means of Streams of Air.) Ludwig Motzko. Oest. Ing. Arch. Ver. July 10, '25.

2. Of Concrete

Rapid Concreting of Apartment Building at Chicago.* Eng. N. R. July 16, '25.
Pittsburgh Stadium Frame Part Concrete and Part Steel.* Eng. N. R. Aug. 6, '25.
Pre-Cast Concrete Flooring and Paving Units.* Can. Engr. Aug. 11, '25.
Studies in Concrete Memorial Tablet Construction.* J. K. Grannis. Eng. N. R. Aug. 20, '25.

3. Of Wood

Konservierung von Holzmasten.* (Preservation of Wooden Masts.) Albert Michl. Oest. Ing. Arch. Ver. July 24, '25.

4. Of Metal

Final Report of the Special Committee on Stresses in Structural Steel. Discussion: Edward Godfrey, Jasper O. Draffin, E. G. Walker and W. E. Belcher. Am. Soc. C. E. Aug., '25.
Standardisation des Câbles Métalliques. Association Belge de Standardisation.* (Standardization of Wire Rope.) Assoc. Ing. Gand. Pt. 2, '25.

h. Foundations

Well-Drilling Methods Applied to Sinking Foundation Piers. Eng. N. R. July 16, '25.
Foundation Under Settling 175-Ft. Chimney Reinforced.* Wilmer Z. Kline. Eng. N. R. Aug. 13, '25.

k. Tunnels and Tunneling-Shield

Lining Pit No. 3 Tunnel Using Pneumatic Concrete Guns.* Eng. N. R. July 23, '25.
Driving Six-Mile Shimizu Tunnel on the Japan Railways.* Yoshiyuki Hashimoto. Eng. N. R. July 30, '25.

x. Miscellaneous

XXIXe Session de l'Association Technique Maritime et Aeronautique, Paris, 25–27 Mai 1925. (XXIXth Session of the Maritime and Aeronautical Technical Association, Paris, 25–27 May, 1925.) Gen. Civ. June 27, '25.

D. Highways

c. Construction

What Highway Investigations Have Shown.* A. T. Goldbeck. Engrs. Soc. W. Pa. June, '25.
Present Chicago Paving Practice.* John B. Hittell. West. Soc. Engrs. July, '25.
Resurfacing and Widening Existing Pavements.* A. J. Schafmayer. West. Soc. Engrs. July, '25.
Paving Problems Adjacent to Street Railway Tracks.* Julius Adler. Engrs. & Eng. Aug., 25.
The Wendover Cutoff in Utah.* Howard C. Means. (Paper read before Am. Assoc. of State Highway Officials.) Eng. & Contr. Aug. 5, '25.
Reconstructing Boston Post Road Thirty-Six Feet Wide.* Eng. N. R. Aug. 6, '25.
Improved Asphalt Mastic Filler for Brick Pavements.* Edgar J. Kelley. Eng. N. R. Aug. 13, '25.
Massachusetts Building Its First Three-Strip Pavement.* Eng. N. R. Aug. 20, '25.
Designing Banked Highway Curves for Safety.* C. J. Myers. Eng. N. R. Aug. 20, '25.

d. Maintenance

Bituminous Road Maintenance. H. H. Piepmeier. Mun. & Co. Eng. July, '25.
Repair Cost of Asphalt Pavements at Columbus, Ohio.* R. H. Simpson. Eng. N. R. July 23, '25.
Road Maintenance Relative to Tramway and Motor Traffic. George M. Hutton. Inst. Mun. & Co. Engrs. July 28, '25.

e. Street Cleaning, Dust Prevention, Snow Removal

Highway Snow Removal Problems. George E. Hamlin. (Paper read before Highway Div. Am. Soc. C. E.) Eng. & Contr. Aug. 5, '25.

g. Machinery and Tools

Some Experiences and Costs in Ditching Machine Operation. F. H. Shaw. (Paper read before Southwestern Public Service Assoc.) Mun. & Co. Eng. July, '25.
Estimating Cost of Elevating Grader Work.* J. L. Harrison. (From *Public Roads.*) Eng. & Contr. Aug. 19, '25.

h. Vehicles. Automobiles. Traffic

The Need for Adequate Street Lighting. O. F. Haas. West. Soc. Engrs. July, '25.
Highway Lighting. R. K. Malcolmson. West. Soc. Engrs. July, '25.
The Banking of Road Curves.* Frederick Law Olmsted. Land. Arch. July, '25.
Eliminating a Highway Bottleneck in New Jersey.* Eng. N. R. July 30, '25.
Elements Governing the Development of Highway Traffic. Discussion: Arthur W. Dean and Van Alen Harris. Am. Soc. C. E. Aug., '25.
Planfreie Gabelungen und Kreuzungen von Kraftwagenstrassen.* (Separated Grade Junctions and Crossings for Automobile Highways.) Renfert. Z. d. Bauver. July 22, '25.

x. Miscellaneous

Testing Subgrade Soils. J. R. Boyd. (From *Public Roads.*) Eng. & Contr. Aug. 5, '25.

E. Bridges, Viaducts, and Arches

New Cantilever Bridge Designed with Architects' Co-Operation.* Norman F. Brown. Eng. N. R. July 16, '25.
Strengthening Iron Bridge with Concrete.* (From *Concrete.*) Eng. & Contr. July 22, '25.
Reconstruction of White River Bridge, De Valls Bluff, Ark. for C. R. I. & P. Ry.* A. S. Armstrong. West. Soc. Engrs. Aug., '25.
Eisen- und Eisenbetonbrücken. (Steel and Reinforced Concrete Bridges.) Hartmann. Oest. Ing. Arch. Ver. July 10, '25.
Die Verbreiterung der Rheinbrücke bei Düsseldorf.* (The Widening of the Rhine Bridge at Dusseldorf.) F. Bohny. Z. d. Bauver. July 15, '25.

d. Concrete and Reinforced Concrete Bridges and Viaducts

Pipe Lines on Bridges.* P. L. Brockway. (From *Public Works.*) Eng. & Contr. July 22, '25.
California Road Bridge Concrete All Tested in Field.* Harlan D. Miller. Eng. N. R. July 30, '25.
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Viaduct is Built of Reinforced Concrete and Encased Steel.* Eng. N. R. Aug. 20, '25.
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f. Suspension Bridges, Transfer Bridges

The Delaware River Bridge.* J. Bernard Walker. Sci. Am. Aug., '25.
Pont Cantilever Suspendu Rigide, sur le Trieux, à Lézardrieux, Cotes-du-Nord.* (Rigid, Suspended Cantilever Bridge Over the Trieux at Lezardrieux, Cotes-du-Nord.) G. Leinekugel Le Cocq. Gen. Civ. July 4, '25.

h. Computations, Tests, etc.

Introduction to a Study of the Wind. Robins Fleming. Can. Engr. July 14, '25.
Research and Experimental Tests in Connection with the Design of the Bridge Over the Delaware River between Philadelphia and Camden.* Clement E. Chase. Engrs. & Eng. Aug., '25.
Secondary Stresses in Bridges. Discussion: F. P. Shearwood and Laurence J. Waller. Am. Soc. C. E. Aug., '25.

F. Inland Waters

c. Regulation of Waterways, Volumes of Discharge, Floods, etc.

Flood Flow Characteristics.* Discussion: H. V. Hinckley, Hardy Cross, E. W. Lane, Gerard H. Matthes, Ford Kurtz, Charles W. Comstock, Thaddeus Merriman, Weston E. Fuller and H. de B. Parsons. Am. Soc. C. E. Aug., '25.
Indianapolis Flood Protection is Progressing.* Eng. N. R. Aug. 6, '25.

g. Consolidation of Banks, Leakage, Maintenance of Channel, Dredging

Blasting Out the Channel Through the Detroit River.* F. J. Byrne. Mun. & Co. Eng. July, '25.
Protection of Lake Shores.* Can. Engr. July 21, '25.

G. Maritime Works

c. Vessels and Maritime Navigation, etc.

Surveying the Oceans with the Non-Magnetic Yacht *"Carnegie"*. J. P. Ault. Sci. Am. July, '25.
An Oil Separator for Purifying Ballast Water Discharged from Ship Fuel-Oil Tanks.* Mech. Eng. Aug., '25.
The Motor Ship Parkeston.* Eng. Serial beginning Aug. 14, '25.

g. Dredges and Dredging. Force Pumps. Refloating and Removing Wrecks. Ice-Breakers

The Diesel-Electric Pipe-Line Dredge "Clackamas".* James H. Polhemus. Mech. Eng. Aug., '25.

h. Wharves. Mooring Buoys. Harbor Equipment

The New Grain Elevator at Capetown Harbour.* Dock & Harbour Serial beginning Aug., '25.
Locust Point Grain Elevator, B. & O. R. R.* Ry. Rev. Aug. 8, '25.

i. Harbors (General Articles)

The Port of Blyth.* Dock & Harbour. Aug., '25.
The Port of Vancouver, British Columbia: Its Development and Future.* Guy H. Kirkpatrick. Dock & Harbour Aug., '25.
Les Travaux d'Aggrandissement et d'Amélioration du Port de Naples.* (The Work of Enlarging and Improving the Port of Naples.) P. Boudreaux. Gen. Civ. June 27, '25.

j. Dockyard Machinery and Shipyards. Dry Docks

The Co-ordination of Rail and Water Transport Facilities by Quayside Machinery of Advanced Design.* E. Logan Hill. Dock & Harbour Aug., '25.

H. Railroads. Street and Interurban Railways. Automobiles. Aeronautics

a. Railroads

1. General Articles

Some Phases of the Illinois Central Railroad Company's Lake Front Improvements and Electrification.* D. J. Brumley. West. Soc. Engrs. Aug., '25.
Seaboard Air Line R. R. Builds Florida Extension.* Ry. Rev. Aug. 1, '25.
Primitive Methods Most Effective on Mexican Project.* Ry. Age Aug. 1, '25.

4. Track

How the World's Railways Maintain Their Tracks.* (Papers read before Int. Ry. Cong.) Ry. Eng. & Main. Aug., '25.
Track Work Reports in the Railway Congress.* Harold A. Smith. Ry. Rev. Aug. 1, '25.
What Is the Average Life of Railroad Crossties.* W. F. Goltra. Ry. Rev. Aug. 15, '25.
Note sur le Raccordement d'une Droite et d'un Cercle, par la Parabole Cubique et la Lemniscate. (Note on the Joining of a Straight Line and a Circle by the Cubic Parabole and the Lemniscate.) E. Minnaert. Assoc. Ing. Gand. Pt. 2, '25.

5. Signals and Safety Apparatus

Great Northern Signals Main Line.* Ry. Age July 25, '25.
C. B. & Q. Controls Switches Remotely.* Ry. Age Aug. 15, '25.

6. Rolling Stock (Locomotives, Cars)

Missouri Pacific Gets Hopper Cars with Improved End Design.* Ry. Age July 25, '25.
Pennsylvania Builds Eight-wheel Switching Locomotive.* July 25, '25.
Santa Fe Type Locomotive Converted to 4-8-2.* Ry. Age Aug. 1, '25.
Electric Trucks in Transfer Service.* Ry. Age Aug. 1, '25.
Oil-Electric Locomotive Performance.* Ry. Age Aug. 1, '25.
Missouri Pacific Three Cylinder Locomotive Tests.* W. W. Baxter. Ry. Rev. Aug. 1, '25.
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8. Stations, Engine Houses, Shops, Terminals

Chicago Union Station Is Formally Opened.* Geo. E. Boyd. Ry. Rev. July 25, '25.
Die neuen Vorschriften für Eisenbauwerke der Deutschen Reichsbahn-Gesellschaft.* (The New Rules for Steel Buildings of the German State Railroad Company.) Rich. Sonntag. Z. d. Bauver. Serial beginning July 8, '25.

f. Aeronautics

1. General Articles

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I. Municipal Water-Works. Agricultural Engineering

a. General Articles

How Jonesborough Started Its Water Works. Beekman C. Little. Am. W. W. Assoc. July, '25.
Municipal Water Supply Problems of Atlanta, Georgia.* Paul H. Norcross. Am. Soc. C. E. Aug., '25.

b. Hydrology. Water Resources

Concrete Wells at Holland, Michigan.* Roy B. Champion. Am. W. W. Assoc. July, '25.
Quantity Production of Ground Water from Wells in Sand.* J. G. Gordon. Eng. N. R. July 30, '25.
From Filters to Small Wells Then to Large Wells.* W. A. Cone. Eng. N. R. Aug. 6, '25.
Die Grundgleichungen des Wasserhaushaltes eines Flussgebietes. (Fundamental Equations of the Water Supply of a River Basin.) Karl Fischer. Z. d. Bauver. May 6, '25.

c. Dams and Reservoirs

What Happened to Municipal Utilities at Santa Barbara.* Eng. N. R. July 23, '25.
Calvaras Reservoir of Spring Valley Water Company.* (From *The Architect and Engineer.*) Eng. & Contr. Aug. 12, '25.

Belt Conveyors Build Wanaque Dam Embankment and Core Wall.* Eng. N. R. Aug. 13, '25.
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d. Analysis and Purification of Water

Report of Committee 12, on Testing of Water Works Materials and Supplies. Am. W. W. Assoc. July, '25.
Important Problems of Filter Plant Operation. C. W. Smedberg. Am. W. W. Assoc. July, '25.
Experience with Chemical Dry Feeders. Am. W. W. Assoc. July, '25.
Interpretation of Water Analyses. J. W. Kellog. Am. W. W. Assoc. Aug., '25.
Relation of Water Supply and Sewage Disposal. George D. Norcom. Am. W. W. Assoc. Aug., '25.
Proposed Rapid Methods of Water Analysis for Boiler Purposes (Applicable to Railroads and Small Steam Plants) with Interpretation of Results. Am. W. W. Assoc. Aug., '25.
Filtration Plant Census, 1924. (Compiled by C. G. Gillespie.) Am. W. W. Assoc. Aug., '25.
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e. Distribution of Water

Dubuque's Air Lift Pumping Plant. J. W. McEvoy. Am. W. W. Assoc. July, '25.
City of Washington Builds Nine-Mile Aqueduct.* Eng. N. R. July 16, '25.
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Sand Sluicing on the Rio Grande Project. (From New *Reclamation Era.*) Eng. & Contr. Aug. 12, '25.

f. Drainage of Land

Back Bay Reclamation, Bombay.* Dock & Harbour Aug., '25.
The Loaded Submarine Telegraph Cable.* Oliver E. Buckley. A. I. E. E. Aug., '25.
Water Table Experiments. J. H. Stewart. (From Am. Peat. Soc. *Journal.*) Can. Engr. Aug. 11, '25.
Drainage Reclaims Waterlogged Land on Old Project.* H. L. Hancock. Eng. N. R. Aug. 13, '25.

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J. Sewerage. Sewage and Refuse Disposal

a. Sewers and Drains

What Happened to Municipal Utilities at Santa Barbara.* Eng. N. R. July 23, '25.
The Reinforced Concrete Arch in Sewer Construction: A Review of Past Practice in Design and An Account of Recent Studies in St. Louis, Missouri.* Charles E. Sharp. Am. Soc. C. E. Aug., '25.
Folkestone New Sea Outfall Works.* E. Carlen Fawcett. Inst. Mun. & Co. Engrs. Aug. 11, '25.
Tests on Composite Tile Block and Concrete Sewer.* Raymond E. Davis. Eng. N. R. Aug. 13, '25.
Versenkung eines Kanalauslassrohres im Rhein.* (The Sinking of a Sewer Discharge Pipe in the Rhine.) Keppner. Gesund. Ing. July 25, '25.

b. Sewage Disposal, Purification

Sewage Disposal Problems in Kansas. Earnest Boyce. (Paper read before Conference on Sewage Treatment.) Mun. & Co. Eng. July, '25.
Sewage Works for Small Districts. J. D. Watson. Inst. Mun. & Co. Engrs. July 28, '25.
Recent Sewage Treatment Developments in America.* Karl Imhoff. Eng. N. R. July 30, '25.
Control of Odors from Sewage Treatment Plants.* Discussion: Morris M. Cohn, C. E. Keefer, C. G. Gillespie and T. Chalkley Hatton. Am. Soc. C. E. Aug., '25.
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c. Refuse Disposal

Elimination of Odors from Garbage Disposal Works. Discussion: John V. Lewis and I. S. Osborn. Am. Soc. C. E. Aug., '25.
Los Angeles Garbage Feeds 40 000 Hogs on Fontana Farm.* Eng. N. R. Aug. 6, '25.
New Refuse Destructor at Toronto, Ont.* J. A. Burnett. Can. Engr. Aug. 11, '25.

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The Detection and Elimination of Odors from Oil Refineries. Discussion: N. E. Loomis and Edward Wright. Am. Soc. C. E. Aug., '25.
The Atmosphere and Its Relations to Human Health and Comfort. Discussion: George A. Soper. Am. Soc. C. E. Aug., '25.

Methods for Determining the Origin, Prevalence, and Effect of Obnoxious Odors and the Evaluation of An Odor Nuisance. Discussion: Charles A. Holmquist, George H. Shaw and L. L. Tribus. Am. Soc. C. E. Aug., '25.
Laws Relating to Obnoxious Odors. Discussion: Joseph A. Warren. Am. Soc. C. E. Aug., '25.
Air Pollution from the Engineer's Standpoint.* John B. C. Kershaw. Engr. Aug. 14, '25.

K. Heat Engines

a. Steam Engines. Boilers

Zur Festigkeitsberechnung von Hochdruck-Kesseltrommeln.* (The Calculation of the Strength of High-Pressure Boiler Shells.) E. Meissner. Schw. Bauz. July 4, '25.

b. Steam Turbines

Les Vibrations des Roues de Turbines à Vapeur.* (The Vibrations of Steam Turbine Wheels.) C. Delanghe. Gen. Civ. Serial beginning July 4, '25.

c. Gas and Oil Engines

The Steam Accumulator.* G. E. Lofgren. Eng. Inst. Can. Aug., '25.

L. Electricity

b. Distribution and Transmission of Electricity

1. Storage Batteries and Cells

Largest Seven-Foot Head Hydro-Electric Plant.* Power July 7, '25.
Diesel Engines and Hydro-Electric Power Stations.* Alfred Buchi. Engr. Serial beginning July 31, '25.
The Osborn (Adelaide) Power Station and Transmission System.* Engr. Serial beginning Aug. 7, '25.

c. Electric Lighting

2. Uses

Chicago Residence Street Light Lighting.* J. C. Hall. West. Soc. Engrs. July, '25.
Electric Shovels.* D. J. Shelton and D. Stoetzel. A. I. E. E. Aug., '25.

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f. Signals and Communication

The New High Power Wireless Station at Daventry.* Engr. July 31, '25.
Carrier Current Telephony on Power Transmission Lines.* N. H. Slaughter. West. Soc. Engrs. Aug., '25.

M. Architecture

d. Storage Buildings

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g. Other Buildings

Motion Picture Theatre Design. Henry Ahrens. (From *Architectural Forum.*) Eng. & Contr. July 22, '25.
Chicago's New Produce Market: Buildings—Equipment.* Eng. N. R. July 23, '25.
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h. Roofs and Domes

Notes on Cupola Design.* Engr. Aug. 7, '25.

l. Fire Protection

Fire Resistance Tests of Concrete Columns.* W. A. Hull and S. H. Ingberg. (From *Fire and Water Engineering.*) Can. Engr. Aug. 11, '25.

x. Miscellaneous

Building Damage at Santa Barbara—Second Report.* Henry D. Dewell. Eng. N. R. July 23, '25.
Earthquake-Resistant Construction: Suggestions from Tokyo. R. F. Moss. Eng. N. R. July 30, '25.
Engineers Discuss Earthquake Experiences and Cautions. Eng. N. R. Aug. 13, '25.

O. Administration. Legislation. Economics. Statistics

d. Administrative and Financial Management of Means of Communication

1. General Questions

Ueber den Aufbau und Charakter der Kosten von Eisenbahnbetrieben.* (On the Composition and Character of Railroad Operating Expenses.) Alfred Walther. Schw. Bauz. Serial beginning July 4, '25.

2. Routes and Roads

Maintenance and Administration of Public Roads Outwith Municipal Areas. Albert V. Hart. Inst. Mun. & Co. Engrs. July 14, '25.

5. Railroads and Street Railways

The Trend of Railway Earnings Shown in Charts.* Harry M. Sperry, M. Am. Soc. C. E. Ry. Age July 25, '25.

The Engineer as a Railroad Executive.* Julius Kruttschnitt. Am. Soc. C. E. Aug., '25.

x. Miscellaneous

The Modern City and the Engineer's Relation to It. Robert Ridgway. Am. Soc. C. E. Aug., '25.

Q. Surveying and Geodesy

Datum Planes—Their Determination for Engineering Uses.* H. A. Marmer. Eng. N. R. July 16, '25.

R. Landscape Engineering

The Study and Selection of Sites for State Parks.* James L. Greenleaf. Land. Arch. July, '25.

Shaw's Garden Subdivision; Construction and Cost Data.* John Noyes. Land. Arch. July, '25.

S. City Planning

How to Lay Out Regions for Planning. Alfred Bettman. (Paper read before Int. Town, City and Regional Planning.) Mun. & Co. Eng. July, '25.

Town Planning for Small Urban and for Rural Districts. G. L. Pepler. Inst. Mun. & Co. Eng. July 14, '25.

Zoning for the Health of the Community. B. Evan Parry. (From paper read before Town Planning Inst. Canada.) Can. Engr. July 21, '25.

Arterial Highways and Hexagonal Planning.* Noulan Cauchon. (From *Town Planning.*) Can. Engr. July 28, '25.

Municipal Undertakings in a Small Borough.* Gilbert A. Ballard. Inst. Mun. & Co. Eng. July 28, '25.

The Smaller Boroughs—Their National Value and Economical Administration. J. W. Hipwood. Inst. Mun. & Co. Eng. July 28, '25.

Employment Service

The Engineering Societies Employment Service is under the joint management of the National Societies of Civil, Mining, Mechanical, and Electrical Engineers as a co-operative Bureau available only to their membership, and maintained by the contributions from the Societies and their individual members who are directly benefited.

Men Available.—Under this heading, brief announcements will be published without charge. These announcements will not be repeated, except on request received after an interval of one month. Names and records will remain in the active files of the Bureau for a period of three months, and are renewable on request. Notice for *Proceedings* should be addressed to Employment Service, 33 West 39th Street, New York, N. Y., and should be received prior to the first of the month.

Opportunities.—A Bulletin of engineering positions available is published weekly and is available to members of the Societies concerned at a subscription rate of $3 per quarter, or $10 per annum, payable in advance. Positions which are not filled promptly as a result of publication in the Bulletin, may be announced herein.

Voluntary Contributions.—Members obtaining positions through the medium of this Service are invited to co-operate with the Societies in the financing of the work by nominal contributions made within thirty days after placement, on the basis of $10 for all positions paying a salary of $2 000 or less per annum; $10 plus 1% of all amounts in excess of $2 000 per annum; temporary positions (of one month or less), 3% of total salary received. The income contributed by the members, together with the finances appropriated by the four Societies named, will be sufficient, it is hoped, not only to maintain but to increase and extend the service.

Replies to Announcements.—Replies to announcements published herein, or in the Bulletin, should be addressed to the key number indicated in each case, with a two-cent stamp attached for re-forwarding. and forwarded to the Employment Service at the address given. Replies received by the Bureau after the positions to which they refer have been filled, will not be forwarded.

MEN AVAILABLE

CIVIL ENGINEER, Assoc. M. Am. Soc. C. E.; age 35. Six years, location, construction of highways and streets, plans and estimates; six years, location, construction, valuation of railroads; one year, plant construction, including sewers, etc.; one year, drainage and irrigation; three years, topographical surveys, land lines, surveys for town and dam sites, subdivisions and maps. Now locating railroad. Survey nearing completion. Available at once. B–7839.

CIVIL ENGINEER; college graduate; four years' experience in reinforced concrete construction, wants position as a designer. B–8711.

CIVIL ENGINEER, Assoc. M. Am. Soc. C. E.; graduate Civil Engineer; age 33; married; eight years varied and valuable experience, irrigation, drainage, railroad valuation, water-works, sewers, steel and concrete bridges, highways, and pavements. Prefers position in West or Northwest. Desires permanent location. Now employed, can leave on reasonable notice. C–284.

JUN. AM. SOC. C. E., Rensselaer, 1924; now transitman with Western railroad, wishes to change to engineering branch with better future. Hydraulic or structural work preferred. Available now. Western location desired if possible. C–335.

Membership

(From August 5 to September 1, 1925)

Additions

		Date of Membership.
ALLEN, Chester Lawrence. Acting Prof., Civ. Eng., Michigan Agricultural Coll. (Res., 407 Grove St.), East Lansing, Mich...	Assoc. M.	June 1, 1925
ANDREWS, Searle Earnhart. 28 Plato Ave., St. Paul, Minn.....	Assoc. M.	June 1, 1925
BISSCHOP, Philip Rowland Roosegaarde. 201 Rissik St., Pretoria, Transvaal, South Africa.....	Jun. Assoc. M.	Aug. 28, 1922 Aug. 31, 1925
BRANIN, Frederick Littell. Asst. County Engr., Burlington County, Mt. Holly (Res., 35 Union St., Medford), N. J.....	Assoc. M.	July 6, 1925
ENSLOW, Linn Harrison. San. Engr., The Chlorine Inst., 1404 Wilmington Ave., Richmond, Va.....	Assoc. M.	July 6, 1925
FREEMAN, Robert Porter. 257 Boulevard St. Louis, Three Rivers, Que., Canada.....	Assoc. M.	Mar. 16, 1925
GEORGE, Gardner Clifford. Designing Engr., Northern New York Utilities, Inc., and The Power Corporation of New York (Res., 719 Holcomb St.), Watertown, N. Y.....	M.	June 1, 1925
GREHAN, Bernard Henry. Eng. Estimator, Geo. J. Glover (Res., 1736 Second St.), New Orleans, La.....	Jun. Assoc. M.	May 15, 1917 July 6, 1925
HOWARD, Henry George. Chf. Engr., Cia. Chilena de Electricidad, Ltd., Casilla 1557, Santiago, Chile.....	Assoc. M.	June 1, 1925
JOHNSON, Arthur. Junior Topographic Engr., U. S. Geological Survey, Tolley, N. Dak.....	Jun.	July 6, 1925
JONES, William Goodwin. Care, City Engr. (Res., 414 East Boulevard), Charlotte, N. C.....	Assoc. M.	June 1, 1925
KRUG, Arthur Gillum. Rua Brasilo Machado No. 16, São Paulo, Brazil.....	M.	July 6, 1925
KRUYS, Frederik. Care, Hanlon, 263 Academy St., Jersey City, N. J.....	Jun.	Mar. 16, 1925
LEE, Donovan Henry. Care, Domiciles, Ltd., West End Green, Hampstead, London, N. W. 6, England.....	Jun.	Mar. 16, 1925
LEE, John Clifford Hodges. Maj., Corps of Engrs., U. S. A., in Office of Chf. of Engrs., U. S. A., Room 2706 Munitions Bldg., Washington, D. C.....	Assoc. M.	July 6, 1925
LINDBERG, Carl Thore Wilhelm. Designer, Elec. Bond & Share Co., 65 Broadway, New York (Res., 42 Garden Pl., Brooklyn), N. Y.....	Jun.	July 6, 1925
NOLEN, John, Jr. Box 640, Tampa, Fla.....	Assoc. M.	July 6, 1925
OLSEN, Viggo Carl. 2116 Sherman Ave., La Grata Court No. 7, Omaha, Nebr.....	Jun.	Jan. 19, 1925
PRIEST, Henry Malcolm. Asst. Engr., Am. Bridge Co., 30 Church St., New York, N. Y.....	Jun. Assoc. M. M.	Nov. 12, 1913 Sept. 9, 1919 July 6, 1925
RAMOS, Theodoro Augusto. 493-A Rua Augusta, São Paulo, Brazil.....	Assoc. M.	Mar. 16, 1925
SCHAEFFER, John Floyd. Constr. Dept., National Lime Assoc., 844 Rush St. (Res., 7310 North Paulina St.), Chicago, Ill....	Assoc. M.	June 1, 1925
SMITH, Robert Joseph. With Kenwood Bridge Co. (Res., Windemere West, 56th and Cornell Ave.), Chicago, Ill.....	M.	June 1, 1925
THAM, Harry Sebastian. Care, H. Van Daren, 137 South West 4th St., Miami, Fla.....	Jun.	July 6, 1925
TRIANA, Jorge. Chf. Engr. on Constr., Cundinamarca R. R., Box No. 5, Bogota, Colombia.....	Jun. Assoc. M.	Mar. 11, 1919 July 6, 1925
WHITMORE, George Dewey. Geodetic Engr., City of Pittsburgh, 908 City-County Bldg., Pittsburgh, Pa.....	Assoc. M.	July 6, 1925

Deaths

CAMP, Walter Mason. Elected Member, May 1, 1901; died August 3, 1925.
FULCHER, Ray Edgar. Elected Associate Member, March 4, 1913; died July 14, 1925.
HOOVER, Joseph Warren. Elected Member, June 6, 1888; died June 18, 1925.
LLEWELLYN, Francis John. Elected Member, November 4, 1896; died July 25, 1925.
McDONOUGH, James Albert. Elected Associate Member, April 3, 1907; Member, May 3, 1910; died August 8, 1925.
ROTCH, William. Elected Member, March 5, 1873; died August 14, 1925.
VAN HOOK, Franklin James. Elected Associate Member, May 7, 1913; died July 26, 1925.

Total Membership of the Society, September 1, 1925

Members	**5 002**	
Associate Members	**5 327**	
Corporate Members		**10 329**
Honorary Members		**13**
Juniors		**803**
Affiliates		**156**
Fellows		**8**
Total		**11 309**